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(54) **METHOD FOR MAKING A PARKING ARRANGEMENT EQUIPPED WITH AN AUTOMATIC VEHICLE DETECTION SYSTEM READY FOR OPERATION, AND PARKING ARRANGEMENT FOR USE OF THE METHOD**

VERFAHREN ZUR HERSTELLUNG EINER PARKANORDNUNG MIT AUTOMATISCHEM BETRIEBSBEREITEM FAHRZEUGERKENNUNGSSYSTEM UND PARKANORDNUNG ZUR DURCHFÜHRUNG DES VERFAHRENS

PROCÉDÉ DE FABRICATION D'UN DISPOSITIF DE STATIONNEMENT ÉQUIPÉ D'UN SYSTÈME DE DÉTECTION DE VÉHICULE AUTOMATIQUE PRÊT À FONCTIONNER, ET DISPOSITIF DE STATIONNEMENT POUR UTILISER LE PROCÉDÉ

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WO-A2-2009/117755 **US-A1- 2004 252 034**

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Description

[0001] The invention relates to a method for making a parking arrangement equipped with an automatic vehicle detection system ready for operation, which parking arrangement comprises a central computer with a database and at least a number of parking places identifiable by a location code, which parking places are each provided with at least one wirelessly operating parking sensor module which is connected with the central computer via a UHF radio link, and which is provided with an identification code, which parking sensor module comprises at least one vehicle sensor which in operation provides measuring values which are representative of the presence or absence of a vehicle in the respective parking place.

[0002] In the following description, "parking place" is understood to mean a parking spot or a parking bay or parking space for a single vehicle. "Parking arrangement" is understood to mean an array of a number of parking places, such as, for instance, a parking lot, a parking garage, a parking zone, a parking lane or the like. "Vehicle" is understood to mean any type of vehicle that can be placed in a parking place, such as, for instance, a passenger car, a van, a camper, an autobus, trailer, etc.

[0003] An example of a parking arrangement in which the present invention can be used is described in Dutch patent 2001994. During or after physically laying out a parking arrangement as described in Dutch patent 2001994 or a similar parking arrangement, whereby the parking places are marked out and each parking place is provided with a number and with a parking sensor module, also named sensor node, provided with an identification code, a coupling needs to be made in the database of the central computer between the individual identification codes of the different sensor nodes and the number and/or the coordinates of the associated parking places.

[0004] Further, from WO 2009/117755 A2 an automated parking guidance and management system is known, in which parking sensor modules are used that can indicate the status of a parking place (occupied, vacant, occupied but not paid for, etc.) by means of light signals. These parking sensor modules are connected via cable work with connecting modules, which in turn are connected with a central computer via cable work and/or wirelessly. These known parking sensor modules are furthermore provided with an RFID reader, which can read out an RFID tag carried along in or on a car. This reference, however, does not disclose nor suggest a method for bringing a parking arrangement of the above-described type in a condition ready for operation, prior to opening to vehicles to be parked.

[0005] From US2004/0252034A1 an automated parking director system is known for directing parking in a parking lot having a plurality of parking spaces. Each parking space has a vehicle detector for detecting the presence of a vehicle in said parking space. In one embodiment the vehicle detectors have an RFID reader for reading out an RFID tag attached to a vehicle. A method for making ready for operation a parking arrangement has not been disclosed in US2004/0252034A1.

[0006] According to a customary practice, an identification code provided on a sensor node, typically a number, is read and noted down by an operator. Thereafter, on a floor plan of the parking arrangement a code designation, such as, for example, a number or the coordinates of the respective parking place, is looked up and noted down next to the just-noted identification number of the sensor node, or the other way around. This is done for all parking places of the parking arrangement and the thus obtained information is manually inputted into the database of the central computer. This is sometimes designated as locating process.

[0007] This is a laborious process, which can easily entail errors. The number of the sensor node, for example, may be poorly legible and hence, or for another reason, be misread, or be noted down incorrectly or be noted down in association with the wrong parking place. When the layout of the parking arrangement is changed, which occurs regularly, especially in the case of open-air lots, the same process needs to be traversed again, and once again errors may occur

[0008] The object of the invention is to improve this process and to reduce the chance of errors. The invention is defined by the appended claims. To this end, according to the invention, a method of the above-described type is characterized in that use is made of parking sensor modules which have an RFID identification circuit, in which the identification code is stored, which identification code is wirelessly readable.

[0009] A parking arrangement according to the invention is characterized in that at least a number of parking places of the parking arrangement are each provided with at least one parking sensor module, which parking sensor module is provided with an RFID identification circuit, in which a wirelessly readable identification code is stored.

[0010] It is noted that in the parking guidance and management system known from WO 2009/117755 A2 the parking sensor modules do not contain an RFID identification circuit.

[0011] In the following, the invention will be described in more detail with reference to the appended drawings.

Figure 1 shows schematically an example of a vehicle detection system for a parking arrangement;
Figure 2 shows schematically a block diagram of an example of a parking sensor module according to the invention;
Figure 3 illustrates schematically an exemplary embodiment of a method according to the invention; and
Figures 4 and 5 illustrate schematically how the relative location of the parking sensor modules can be matched with the geographic position of the corresponding parking places.

[0012] Figure 1 shows schematically an example of a

vehicle detection system 1 for a parking arrangement according to the invention. The vehicle detection system shown comprises a number of parking sensor modules, also named sensor nodes, indicated with P1, P2, ...Pn, Pn+1, ... Pm. The sensor nodes correspond to the different parking places of the parking arrangement. The sensor nodes are typically, but not necessarily, divided into a number of groups, whereby the sensor nodes of a group can communicate with an intermediate station, which in turn can communicate with the central computer of the vehicle detection system.

[0013] In the example shown, the sensor nodes P1 ... Pn form a first group 2 and the sensor nodes Pn+1 ... Pm form a second group 3. Group 2 can communicate with an associated intermediate station 4 via a connection 5, while group 3 can communicate with an intermediate station 6 via a connection 7.

[0014] The intermediate stations 4 and 6 can communicate with the central computer 10 via connections 8, 9. The connections 5, 7, 8, and 9 could, if desired, consist wholly or partly of wired connections, but are preferably wireless connections. When in a parking place a condition change occurs, as a result of a vehicle arriving or leaving, this is detected by the sensor node associated with that parking place and passed on via the associated intermediate station to the central computer.

[0015] It is noted that a parking arrangement can also be so configured that the sensor nodes communicate directly, or via other sensor nodes, with the central computer without intervention of intermediate stations such as the intermediate stations 4 and 6.

[0016] It is further noted that, if desired, it is possible to provide a parking place with more than one sensor node. In the present description of an exemplary embodiment of the invention, the starting point is an automatic vehicle detection system with a single sensor node per parking place. Furthermore, more or fewer than two groups of sensor nodes may be used depending on the nature of the parking arrangement.

[0017] Figure 2 shows schematically the structure of an example of a parking sensor module P for use in a method or arrangement according to the invention. In the example shown, the parking sensor module (sensor node) P comprises a vehicle sensor 20, which can comprise, for example, one or more magnetic sensors, such as described, for example, in applicant's Dutch patent 2001994. The vehicle sensor 20 is connected with a microcontroller 21, which receives signals generated by the vehicle sensor via a connection 22, processes them and transmits them to the central computer via a radio link with a transmitter/receiver 23 and an antenna 24. Communication between the sensor nodes mutually may also take place via this radio link. The radio link is usually a UHF link.

[0018] The sensor node in this example furthermore comprises a low-frequency (LF) transmitter/receiver 25 with an LF antenna not shown separately. The transmitter/receiver 25 forms an RFID (Radio Frequency Identification Device) transponder, whose function will be further elucidated hereinbelow. Further, the sensor node is provided with a battery 26 for providing supply voltage to the different circuits of the sensor node.

[0019] Figure 3 illustrates schematically a method according to the invention. The figure shows an operator 30 having in one hand a portable or mobile RFID reader 31, whose antenna 32 arranged on an extension stick 33 is held close to a sensor node P. The reader 31, if desired, may also be mounted lower on the stick 33 or may even, in a single housing together with the antenna, be attached to the distal end of the stick. However, the reader may also be connected to the antenna with a wire, via the stick or not so, and be worn elsewhere on the body of the operator, for example, suspended from his belt or on his back. With the aid of the reader, the RFID transponder 25, in which the identification code, typically consisting of just a number, of the sensor node P is electronically stored, can be read out. The reader 31 is coupled, for instance via Bluetooth, with a so-called smartphone 34, carried along by the operator, and the read-out identification code of the sensor node P is automatically stored in the memory of the smartphone. The operator now only needs to input the location code, such as, for example, the number or the coordinates of the parking place, into the memory of the smartphone manually and forward it to the central computer 10 at a suitable time.

[0020] As the identification code of the sensor node is automatically read and electronically stored in the smartphone, the chance of errors is reduced considerably. If the parking places are consecutively numbered, the chance of errors can be further reduced by an automatic or semiautomatic increase or decrease of the parking place number in the smart phone application. Automatic increase or decrease may be done by coupling this to the input of a next identification code of a sensor node. For semiautomatic increase/decrease, for example, a button on the smartphone programmed for that purpose may be utilized.

[0021] The locating process may be further supported by utilizing a positioning system. To this end, for example, the GPS function of the smartphone may be utilized to input the coordinates of the parking place associated with a sensor node into the memory of the smartphone and to couple it to a sensor node identification code which has been read or is to be read with the reader 31.

[0022] The current possibilities of the GPS system, whether or not still adversely affected by the so-called Urban Canyon effect, do not always provide sufficient accuracy of the position determinations, so that in such situations the GPS function cannot wholly replace the manual input of parking place numbers or coordinates or the above-described automatic or semiautomatic increase/decrease of the parking place numbers. On the other hand, it does allow large deviations in the input, for example due to typing errors, to be signaled and then corrected.

[0023] Through the planned introduction of a more ac-

curate positioning system, such as, for example, the European Galileo system, positioning by means of a satellite system is expected to improve considerably. Manual input of the position data might then become redundant.

[0024] The RFID transponder 25 of the sensor nodes can also be used for logistics during the production of the sensor nodes.

[0025] For normal operation, i.e., relaying parking information, communication between the sensor nodes mutually and from the nodes to the central computer takes place via a UHF radio link, as indicated in Figure 1 at 5, 7, 8, and 9 and in Figure 2 at 23, 24. However, for communication between a sensor node P and the reader 31, UHF signals are less suitable. Due to the large range of UHF signals and the small distance between adjacent sensor nodes, it is not always certain that with a reader suitable for UHF signals the correct identification code of a sensor node is registered if the automatic identification of the sensor nodes were carried out via the UHF link 23, 24.

[0026] A solution to this problem is to utilize a low-frequency RFID method, as has already been described hereinabove.

[0027] The low-frequency transmitter/receiver 25 may be utilized, in a similar manner to that described in applicant's older Dutch patent application NL2005776, understood to be incorporated herein by reference, to determine the distance of each sensor node to neighboring sensor nodes. By their nature, the sensor nodes are normally all situated substantially in the same horizontal plane. As the sensor nodes are located close to each other, typically at a mutual distance in the order of 2.5 to 3 meters, in the use of magnetic fields low frequencies are employed in the so-called near field. In this near field it holds that the relation between field strength and distance r to the transmitter is inversely proportional to the third power of the distance r. Hence, the field strength at a distance r from an LF transmitter is proportional to $1/r^3$ and is a measure of the distance between the transmitter and the receiver.

[0028] By successively using a transponder circuit 25, or at least its antenna coil, of one of the sensor nodes as LF transmitter and using the transponder circuits of the other sensor nodes as LF receiver, it is possible, with the thus determined distances between the different nodes and utilizing algorithms known per se, to make by software a kind of ground plan of the relative location of the sensor nodes with respect to each other. For successively activating one of the sensor nodes as LF transmitter while the other sensor nodes operate as LF receiver, existing techniques can be utilized. A suitable technique is the so-called TDMA (Time Division Multiple Access) method. This technique can be used for the UHF communication of the nodes, and the means then present for this purpose anyway can also be used to determine, under the control of the central computer and/or the microcontrollers 21, by means of LF communication between the nodes, the relative location of the nodes with respect to each other.

[0029] Since in each case just one of the sensor nodes works in the transmission mode, accordingly, in contrast with the system described in NL 2005776, just one transmission frequency needs to be employed. Having regard to applicable regulations, the transmission frequency can be in the range of about 30 kHz to about 70 kHz, for instance, around 50 kHz.

[0030] The map of the relative location of the sensor nodes with respect to each other can, together with the plan of the physical parking arrangement itself, be represented on the display of the central computer 10.

[0031] Figure 4 shows schematically an example of a ground plan of a parking arrangement 40 with the parking places 41 and an entrance 42 and an exit 43 indicated thereon. Further, Figure 4 shows the map 44 of the relative location of the sensor nodes with respect to each other. The ground plan may be drawn in a usual manner and be inputted in the computer, but optionally the maps of Google Maps may be utilized for this purpose. The coordinates of the parking places can be simply obtained therefrom.

[0032] With some forms of the layout of the parking places, the map 44 of the sensor nodes can be laid on the map 41 of the parking places so as to match it in a simple manner by shifting and/or turning and/or enlarging or reducing. Thus, the identification codes of the sensor nodes are unequivocally coupled to the physical parking places. This is the case with the parking arrangement 40 shown in Figure 4. Figure 5 shows how the map 44 of the sensor nodes has been laid on the map of the parking places on the display 45 of a monitor 46 of the central computer 10 with an unequivocal match.

[0033] In principle, it is not necessary then to manually couple the identification codes of the sensor nodes to the geographical position of the parking places with the aid of the reader 31. For checking purposes, of course, the reader can still be used.

[0034] In cases where the map of the sensor nodes can be laid on the map of the parking places in several matching ways, it is necessary to couple the codes of a small number of sensor nodes to the associated physical parking places. The operator can do this in the manner already described with the aid of the reader 31 and the smartphone 34.

[0035] The determination of the distance between a sensor node and the other sensor nodes situated in the surroundings of that sensor node with the aid of low-frequency magnetic fields provides a very reliable result. The low-frequency signals, unlike UHF signals, are not influenced, or influenced to a very minor extent only, by the surroundings.

[0036] It is also possible, however, to use the UHF communication link between the sensor nodes and the central computer to automatically make, with the aid of suitable software, a map of the relative location of the sensor nodes with respect to each other. To promote a reliable and fast communication between the sensor

nodes and the central computer, additional intermediate stations (relay nodes) can be used, such as indicated, for example, at 4 and 6 in Figure 1. In view of the so-called Brewster angle effect, these intermediate stations are preferably mounted high, for example, in a lamppost or a special pole or to the wall of a building or the like.

[0037] With a number of those intermediate stations, the difference in transmission time of UHF signals from sensor nodes to the intermediate stations can be determined. Based on the difference in transmission time, the positions of the sensor nodes with respect to the intermediate stations can be calculated. Utilizing modern techniques for phase measurements, known per se, the different transmission times can be simply calculated.

[0038] As soon as the location of the sensor nodes with respect to the intermediate stations is known, again a plan of the location of the sensor nodes can be made, which can thereupon be depicted on the geographical plan of the parking places, in the manner illustrated in Figures 4 and 5.

[0039] It is also possible to provide a number of sensor nodes and/or intermediate stations with a GPS receiver or a comparable receiver, so that the geographical position of these sensor nodes and/or intermediate stations is already fixed and the coupling between the parking places and the sensor nodes can take place automatically. The reader 31 and the smartphone may then be used for checking and correction purposes only.

[0040] The just-described UHF method is less accurate than the earlier-described LF method, though expectably this will not be a drawback at least in a number of situations, depending on nature and location of the parking arrangement.

[0041] It is noted that after the foregoing diverse modifications and variants will be clear to those skilled in the art. Thus, the reader 31 with the associated antenna may be carried along by the operator in various manners. For example, instead of a stick for the antenna of the reader 31, or in combination therewith, also a kind of small cart with wheels can be used, to which the antenna is attached. Such a cart could also be provided with propelling means and with a seat for the operator. Such modifications and variants are understood to be within the purview of the invention, as described in the appended claims.

Claims

1. A method for making ready for operation a parking arrangement (40) equipped with an automatic vehicle detection system (1), which parking arrangement (40) comprises a central computer (10) with a database and at least a number of parking places (41) identifiable by a location code, which parking places are each provided with at least one wirelessly operating parking sensor module (P) which is connected with the central computer via a UHF radio link (23, 24) and which has a RFID identification circuit (25) which is provided with an identification code, which parking sensor module (P) comprises at least one vehicle sensor (20) which in operation provides measuring values which are representative of the presence or absence of a vehicle in the respective parking place (41), wherein use is made of the parking sensor modules (P) in which the identification code is stored, which identification code is wirelessly readable, and wherein the identification codes of the individual parking sensor modules (P) are coupled in the database of the central computer (10) to the location codes of the individual parking places (41) by reading out in each case the identification code of a parking sensor module (P) of a parking place (41) with a wirelessly operating reader (31) and storing it in a memory together with the location code of the parking place (41) inputted in the memory.

2. A method according to claim 1, **characterized in that** the data inputted into the memory are sent to the database of the central computer (10).

3. A method according to claim 1 or 2 **characterized in that** the location codes of the parking places are manually inputted into the memory.

4. A method according to any one of the preceding claims, **characterized in that** for reading out the identification codes of the parking sensor modules (P) a reader (31) is used with an antenna (32) placed at a distance, so that the antenna (32) can be simply brought close to a parking sensor module (P) by an operator (30) for reading out an identification code of said parking sensor module (P).

5. A method according to any one of the preceding claims 1,2 and 4, **characterized in that** the parking places (41) are provided with consecutive numbers as location codes and that the smartphone (34) is programmed, upon each input of an identification code of a parking sensor module (P), to automatically or semiautomatically increase or decrease the number of the parking place (41), so that manual input of the location codes is not necessary.

6. A method according to any one of claims 2 through 5, **characterized in that** at least as support for determining the location of individual parking places (41), use is made of a position determining function of the smartphone (34).

7. A method according to any one of the preceding claims, **characterized in that** the RFID identification circuit (25) of the parking sensor modules (P) is a low-frequency circuit, and that for creating a map (44) of the relative location of the parking sensor modules (P) with respect to each other use is made of a distance determination of the parking sensor

modules (P) with respect to each other by each time using the RFID identification circuit (25) of one parking sensor module (P) as transmitter for generating a low-frequency magnetic field and using the parking sensor modules (P) in the surroundings to receive the magnetic field and to measure the strength thereof at the receiving modules (P).

8. A method according to any one of the preceding claims, **characterized in that** for the UHF radio link (23, 24) between the parking sensor modules (P) and the central computer (10) use is made of high-placed intermediate stations (4, 6) and that at least a number of those intermediate stations (4, 6) are used to determine the transmission time differences of signals transmitted between the parking sensor modules (P) and the intermediate stations (4, 6) with the aid of phase measuring techniques, after which on the basis of the transmission time differences in the central computer (10) a map (44) of the relative location of the parking sensor modules (P) with respect to each other is created.

9. A method according to claim 7 or 8, **characterized in that** on the display of the central computer (10) the map (44) of the relative location of the parking sensor modules (P) with respect to each other is depicted together with a map of the geographical location of the parking places (41) and that the parking places (41) are coupled to the parking sensor modules (P) by depicting the map (44) of the parking sensor modules (P) on a map of the parking places (41) in a matching manner by shifting and/or turning and/or enlarging or reducing.

10. A method according to claim 8, **characterized in that** at least a number of the intermediate stations (4, 6) are provided with a position determining module and that for coupling the parking sensor modules (P) to the geographical positions of the parking places (41) use is made of the position information obtained by means of the position determining modules.

11. A parking arrangement (40) comprising: a central computer (10) with a database and at least a number of parking places (41) provided with a location code, the parking places are each provided with at least one wirelessly operating parking sensor module (P) which has a RFID identification circuit (25) configured to store an identification code and which is connected with the central computer via a UHF radio link (23, 24), the parking sensor module (P) comprises at least one vehicle sensor (20) configured to measuring values which are representative of the presence or absence of a vehicle in the respective parking place (41), the parking sensor modules (P), are configured to enable that the stored identification code is wirelessly readable, and the database of the central computer (10) is configured to couple the identification codes of the individual parking sensor modules (P) with the location codes of the individual parking places (41), a wirelessly operating RFID reader (31) configured to reading out the identification code of a parking sensor module (P) of a parking place (41) and storing the identification code in a memory together with the location code of the parking place (41) inputted in the memory.

12. A parking arrangement (40) according to claim 11, **characterized in that** the parking sensor modules (P) are provided with a low-frequency operating transmitter/receiver for respectively transmitting and receiving a magnetic field and with means of measuring the strength of a received magnetic field.

13. A parking arrangement according to claim 12, **characterized in that** the low-frequency operating transmitter/receiver is coupled with the antenna coil of the RFID identification circuit (25).

14. A parking arrangement (40) according to claim 11 or 12 or for use of a method according to any one of claims 1 through 10, wherein the parking sensor modules (P) are configured to communicate with a central computer (10) via a high-frequency radio link via an intermediate station (4, 6), **characterized in that** at least a number of intermediate stations (4, 6) are placed high and are provided with means to determine the transmission time differences of signals coming from different parking sensor modules (P).

15. A parking arrangement (40) according to claim 14, **characterized in that** at least a number of the high placed intermediate stations (4, 6) are provided with a position determining device.

Patentansprüche

1. Verfahren zum Herstellen der Betriebsbereitschaft einer mit einem automatischen Fahrzeugerkennungssystem (1) ausgestatteten Parkanordnung (40), die einen Zentralrechner (10) mit einer Datenbank und wenigstens mehreren Parkplätzen (41) umfasst, die durch einen Standortcode identifiziert werden können, welche Parkplätze jeweils mit wenigstens einem drahtlos arbeitenden Parksensormodul (P) versehen sind, das über eine UHF-Funkverbindung (23, 24) mit dem Zentralrechner verbunden ist und eine RFID-Identifikationsschaltung (25) aufweist, die mit einem Identifikationscode versehen ist, wobei das Parksensormodul (P) wenigstens einen Fahrzeugsensor (20) umfasst, der während des Betriebs Messwerte bereitstellt, die für das Vorhandensein oder Fehlen eines Fahrzeugs auf dem je-

weiligen Parkplatz (41) repräsentativ sind, wobei die Parksensormodule (P) verwendet werden, in denen der Identifikationscode gespeichert ist, welcher Identifikationscode drahtlos lesbar ist und wobei die Identifikationscodes des einzelnen Parksensormodule (P) in der Datenbank des Zentralrechners (10) mit den Ortscodes der einzelnen Parkplätze (41) gekoppelt werden, indem jeweils der Identifikationscode eines Parksensormoduls (P) eines Parkplatzes (41) mit einem drahtlos arbeitenden Lesegerät (31) ausgelesen wird und in einem Speicher zusammen mit dem in den Speicher eingegebenen Ortscode des Parkplatzes (41) gespeichert wird.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die in den Speicher eingegebenen Daten an die Datenbank des Zentralrechners (10) gesendet werden.

3. Verfahren nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Ortscodes der Parkplätze manuell in den Speicher eingegeben werden.

4. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zum Auslesen der Identifikationscodes der Parksensormodule (P) ein Lesegerät (31) mit einer im Abstand angeordneten Antenne (32) verwendet wird, so dass die Antenne (32) einfach von einem Bediener (30) in die Nähe eines Parksensormoduls (P) gebracht werden kann, um einen Identifikationscode des Parksensormoduls (P) auszulesen.

5. Verfahren nach einem der vorhergehenden Ansprüche 1, 2 und 4, **dadurch gekennzeichnet, dass** die Parkplätze (41) mit fortlaufenden Nummern als Ortscodes versehen werden und dass das Smartphone (34) bei jeder Eingabe eines Identifikationscodes eines Parksensormoduls (P) programmiert wird, um die Anzahl der Parkplätze (41) automatisch oder halbautomatisch zu erhöhen oder zu verringern, so dass eine manuelle Eingabe der Ortscodes nicht erforderlich ist.

6. Verfahren nach einem der Ansprüche 2 bis 5, **dadurch gekennzeichnet, dass** wenigstens zur Unterstützung der Standortbestimmung einzelner Parkplätze (41) eine Funktion der Positionsbestimmung des Smartphones (34) verwendet wird.

7. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die RFID-Identifikationsschaltung (25) der Parksensormodule (P) eine Niederfrequenzschaltung ist, und dass zur Erstellung einer Karte (44) des relativen Ortes der Parksensormodule (P) zueinander eine Abstandsbestimmung der Parksensormodule (P) zueinander verwendet wird, wobei jedes Mal die RFID-Identifikationsschaltung (25) eines Parksensormoduls (P) als Sender zur Erzeugung eines niederfrequenten Magnetfeldes verwendet wird und die Parksensormodule (P) in der Umgebung verwendet werden, um das Magnetfeld zu empfangen und dessen Stärke an den Empfangsmodulen (P) zu messen.

8. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** für die UHF-Funkverbindung (23, 24) zwischen den Parksensormodulen (P) und dem Zentralrechner (10) hochgestellte Zwischenstationen (4, 6) verwendet werden, und dass wenigstens mehrere dieser Zwischenstationen (4, 6) zur Ermittlung der Sendezeitdifferenzen von zwischen den Parksensormodulen (P) und den Zwischenstationen (4, 6) übertragenen Signalen mit Hilfe von Phasenmesstechniken verwendet werden, nach denen anhand der Sendezeitdifferenzen im Zentralrechner (10) eine Karte (44) des relativen Ortes der Parksensormodule (P) zueinander erstellt wird.

9. Verfahren nach Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** auf dem Display des Zentralrechners (10) die Karte (44) des relativen Ortes der Parksensormodule (P) zueinander zusammen mit einer Karte der geografischen Lage der Parkplätze (41) dargestellt wird und dass die Parkplätze (41) mit den Parksensormodulen (P) gekoppelt sind, wobei die Karte (44) der Parksensormodule (P) auf einer Karte der Parkplätze (41) in passender Weise durch Verschieben und/oder Drehen und/oder Vergrößern oder Verkleinern abgebildet ist.

10. Verfahren nach Anspruch 8, **dadurch gekennzeichnet, dass** wenigstens mehrere der Zwischenstationen (4, 6) mit einem Positionsbestimmungsmodul versehen sind und dass zur Kopplung der Parksensormodule (P) an die geografischen Positionen der Parkplätze (41) die mittels der Positionsbestimmungsmodule erhaltenen Positionsinformationen verwendet werden.

11. Parkanordnung (40), umfassend: einen Zentralrechner (10) mit einer Datenbank und wenigstens mehreren mit einem Ortscode versehenen Parkplätzen (41), wobei die Parkplätze jeweils mit wenigstens einem drahtlos arbeitenden Parksensormodul (P) versehen sind, das eine RFID-Identifikationsschaltung aufweist (25), die zum Speichern eines Identifikationscodes konfiguriert ist und die über eine UHF-Funkverbindung (23, 24) mit dem Zentralrechner verbunden ist, wobei das Parksensormodul (P) wenigstens einen Fahrzeugsensor (20) umfasst, das zum Messen von Werten konfiguriert ist, die für das Vorhandensein oder Fehlen eines Fahrzeugs auf dem jeweiligen Parkplatz (41) repräsentativ sind, wobei die Parksensormodule (P) so konfiguriert

sind, dass der gespeicherte Identifikationscode drahtlos auslesbar ist, und die Datenbank des Zentralrechners (10) konfiguriert ist, um die Identifikationscodes der einzelnen Parksensormodule (P) mit den Ortscodes der einzelnen Parkplätze (41) zu koppeln, wobei ein drahtlos arbeitendes RFID-Lesegerät (31) konfiguriert ist, um die Identifikationscodes eines Parksensormoduls (P) eines Parkplatzes (41) auszulesen und den Identifikationscode in einem Speicher zusammen mit dem in den Speicher eingegebenen Ortscode des Parkplatzes (41) zu speichern.

12. Parkanordnung (40) nach Anspruch 11, **dadurch gekennzeichnet, dass** die Parksensormodule (P) mit einem niederfrequent arbeitenden Sender/Empfänger zum Senden bzw. Empfangen eines Magnetfeldes und mit Mitteln zum Messen der Stärke eines empfangenen Magnetfeldes versehen sind.

13. Parkanordnung nach Anspruch 12, **dadurch gekennzeichnet, dass** der niederfrequent arbeitende Sender/Empfänger mit der Antennenspule der RFID-Identifikationsschaltung (25) gekoppelt ist.

14. Parkanordnung (40) nach Anspruch 11 oder 12 oder zur Verwendung eines Verfahrens nach einem der Ansprüche 1 bis 10, wobei die Parksensormodule (P) konfiguriert sind, um mit einem Zentralrechner (10) über eine hochfrequente Funkverbindung über eine Zwischenstation (4, 6) zu kommunizieren, **dadurch gekennzeichnet, dass** wenigstens mehrere von Zwischenstationen (4, 6) hochgestellt sind und mit Mitteln zur Bestimmung der Sendezeitdifferenzen von Signalen versehen sind, die von verschiedenen Parksensormodulen (P) kommen.

15. Parkanordnung (40) nach Anspruch 14, **dadurch gekennzeichnet, dass** wenigstens mehrere der hochgestellten Zwischenstationen (4, 6) mit einer Positionsbestimmungseinrichtung versehen sind.

Revendications

1. Procédé destiné à fabriquer un dispositif de stationnement prêt à fonctionner (40) équipé d'un système de détection de véhicule automatique (1), ledit dispositif de stationnement (40) comprenant un ordinateur central (10) avec une base de données et au moins un nombre de places de stationnement (41) identifiables par un code de position, lesdites places de stationnement étant chacune munies d'au moins un module de capteur de stationnement sans fil (P) qui est relié à l'ordinateur central via une liaison radio UHF (23, 24) et qui possède un circuit d'identification RFID (25) qui est muni d'un code d'identification, ledit module de capteur de stationnement (P) comprenant au moins un capteur de véhicule (20) qui, en fonctionnement, fournit des valeurs de mesure qui sont représentatives de la présence ou de l'absence d'un véhicule sur la place de stationnement respective (41), dans lequel les modules de capteurs de stationnement (P) dans lesquels le code d'identification est stocké sont utilisés, ledit code d'identification étant lisible sans fil, et dans lequel les codes d'identification des modules de capteurs de stationnement individuels (P) sont liés, dans la base de données de l'ordinateur central (10), aux codes de position des places de stationnement individuelles (41) en lisant dans chaque cas du code d'identification d'un module de capteur de stationnement (P) d'une place de stationnement (41) avec un lecteur sans fil (31), et en le stockant dans une mémoire avec le code de position de la place de stationnement (41) saisi dans la mémoire.

2. Procédé selon la revendication 1, **caractérisé en ce que** les données saisies dans la mémoire sont envoyées vers la base de données de l'ordinateur central (10).

3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** les codes de position des places de stationnement sont saisis manuellement dans la mémoire.

4. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que**, pour lire les codes d'identification des modules de capteurs de stationnement (P), un lecteur (31) est utilisé avec une antenne (32) placée à une distance, de sorte que l'antenne (32) puisse être simplement placée à proximité d'un module de capteur de stationnement (P) par un opérateur (30) pour lire un code d'identification dudit module de capteur de stationnement (P).

5. Procédé selon l'une quelconque des revendications précédentes 1, 2 et 4, **caractérisé en ce que** les places de stationnement (41) sont munies de numéros consécutifs en guise de codes de position, et **en ce que** le smartphone (34) est programmé, lors de chaque saisie d'un code d'identification d'un module de capteur de stationnement (P), pour augmenter ou diminuer automatiquement ou semi-automatiquement le numéro de la place de stationnement (41), de sorte que la saisie manuelle des codes de position ne soit pas nécessaire.

6. Procédé selon l'une quelconque des revendications 2 à 5, **caractérisé en ce qu'**au moins, en guise de support destiné à déterminer la position des places de stationnement individuelles (41), une fonction de détermination de position du smartphone (34) est utilisée.

7. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le circuit d'identification RFID (25) des modules de capteurs de stationnement (P) est un circuit basse fréquence, et **en ce que**, pour créer une carte (44) de la position relative des modules de capteurs de stationnement (P) les uns par rapport aux autres, une détermination de distance des modules de capteurs de stationnement (P) les uns par rapport autres est utilisée, en utilisant à chaque fois le circuit d'identification RFID (25) d'un module de capteur de stationnement (P) comme émetteur destiné à générer un champ magnétique basse fréquence, et en utilisant les modules de capteurs de stationnement (P) dans les alentours afin de recevoir le champ magnétique et de mesurer l'intensité de celui-ci au niveau des modules de réception (P).

8. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que**, pour la liaison radio UHF (23, 24) entre les modules de capteurs de stationnement (P) et l'ordinateur central (10), des stations intermédiaires placées en hauteur (4, 6) sont utilisées, et ce qu'au moins un nombre de ces stations intermédiaires (4, 6) est utilisé pour déterminer les différences de temps de transmission des signaux transmis entre les modules de capteurs de stationnement (P) et les stations intermédiaires (4, 6) à l'aide de techniques de mesure de phase, après quoi, sur la base des différences de temps de transmission dans l'ordinateur central (10), une carte (44) de la position relative des modules de capteurs de stationnement (P) les uns par rapport aux autres est créée.

9. Procédé selon la revendication 7 ou 8, **caractérisé en ce que**, sur l'écran de l'ordinateur central (10), la carte (44) de la position relative des modules de capteurs de stationnement (P) les uns par rapport aux autres est représentée avec une carte de la position géographique des places de stationnement (41), et **en ce que** les places de stationnement (41) sont liées aux modules de capteurs de stationnement (P) en représentant la carte (44) des modules de capteurs de stationnement (P) sur une carte des places de stationnement (41) par correspondance ,par déplacement, et/ou par rotation, et/ou par agrandissement ou réduction.

10. Procédé selon la revendication 8, **caractérisé en ce qu'**au moins un nombre de stations intermédiaires (4, 6) est muni d'un module de détermination de position, et **en ce que**, pour lier les modules de capteurs de stationnement (P) aux positions géographiques des places de stationnement (41), les informations de position obtenues au moyen des modules de détermination de position sont utilisées.

11. Dispositif de stationnement (40) qui comprend : un ordinateur central (10) avec une base de données et au moins un nombre de places de stationnement (41) munies d'un code de position, les places de stationnement étant chacune munies d'au moins un module de capteur de stationnement sans fil (P) qui possède un circuit d'identification RFID (25) configuré pour stocker un code d'identification, et qui est relié à l'ordinateur central via une liaison radio UHF (23, 24), le module de capteur de stationnement (P) comprenant au moins un capteur de véhicule (20) configuré pour fournir des valeurs de mesure qui sont représentatives de la présence ou de l'absence d'un véhicule sur la place de stationnement respective (41), les modules de capteurs de stationnement (P) étant configurés pour permettre au code d'identification stocké d'être lisible sans fil, et la base de données de l'ordinateur central (10) étant configurée pour lier les codes d'identification des modules de capteurs de stationnement (P) aux codes de position des places de stationnement individuelles (41), un lecteur RFID sans fil (31) étant configuré pour lire le code d'identification d'un module de capteur de stationnement (P) d'une place de stationnement (41) et pour stocker le code d'identification dans une mémoire avec le code de position de la place de stationnement (41) saisi dans la mémoire.

12. Dispositif de stationnement (40) selon la revendication 11, **caractérisé en ce que** les modules de capteurs de stationnement (P) sont munis d'un émetteur/récepteur basse fréquence destiné à transmettre et recevoir respectivement un champ magnétique, et d'un moyen de mesure de l'intensité d'un champ magnétique reçu.

13. Dispositif de stationnement selon la revendication 12, **caractérisé en ce que** l'émetteur/récepteur basse fréquence est relié à la bobine d'antenne du circuit d'identification RFID (25).

14. Dispositif de stationnement (40) selon la revendication 11 ou 12 ou destiné à utiliser un procédé selon l'une quelconque des revendications 1 à 10, dans lequel les modules de capteurs de stationnement (P) sont configurés pour communiquer avec un ordinateur central (10) via une liaison radio basse fréquence via une station intermédiaire (4, 6), **caractérisé en ce qu'**au moins un nombre de stations intermédiaires (4, 6) est placé en hauteur et est muni d'un moyen de détermination des différences de temps de transmission des signaux qui proviennent de différents modules de capteurs de stationnement (P).

15. Dispositif de stationnement (40) selon la revendication 14, **caractérisé en ce qu'**au moins un nombre de stations intermédiaires placées en hauteur (4, 6) est muni d'un dispositif de détermination de position.

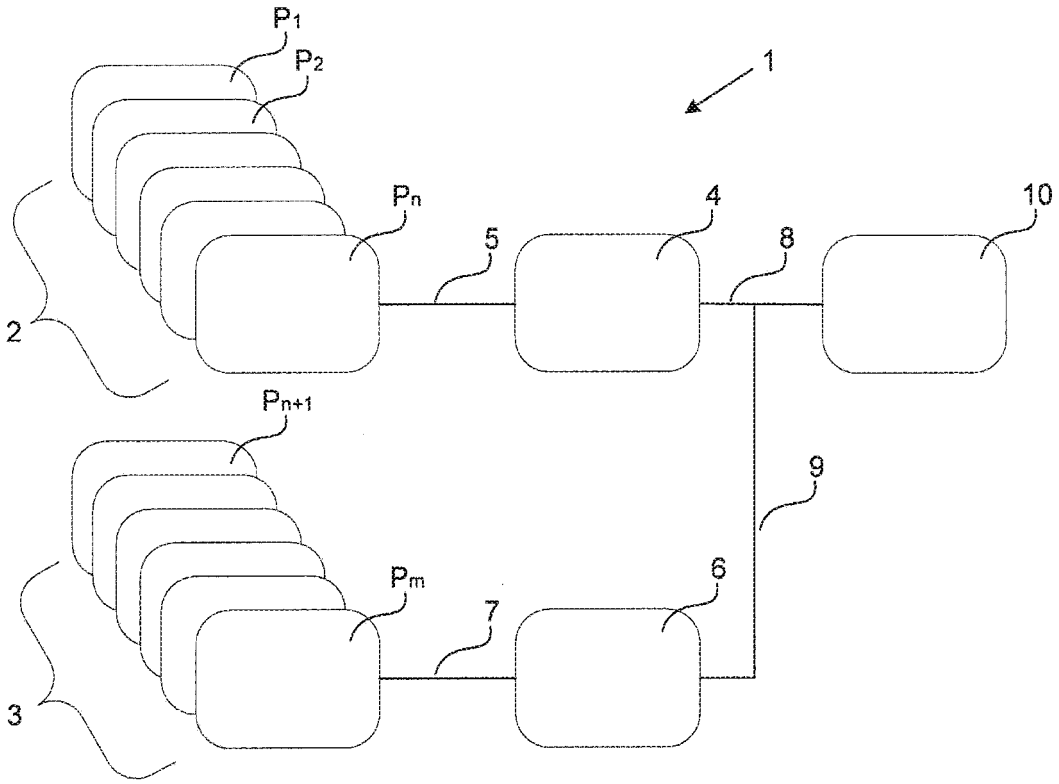


fig. 1

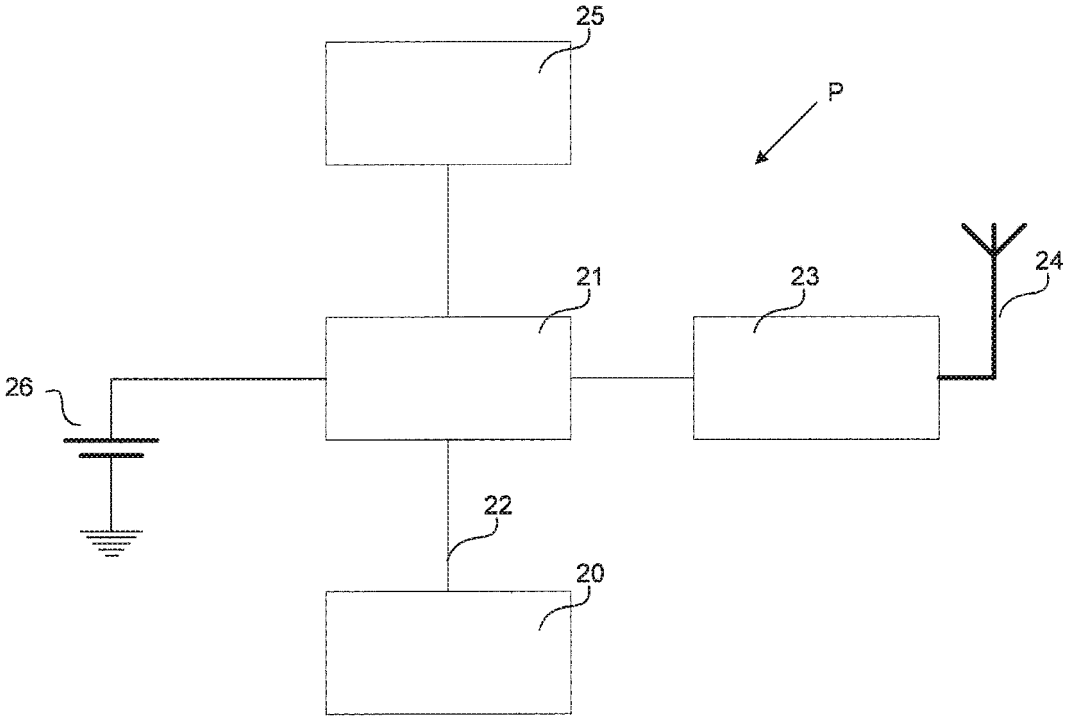


fig. 2

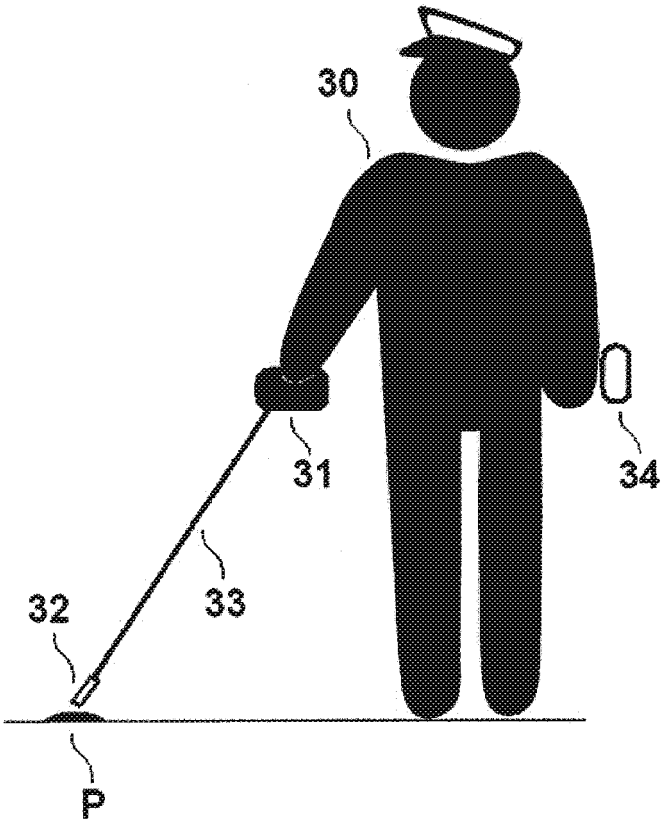


fig. 3

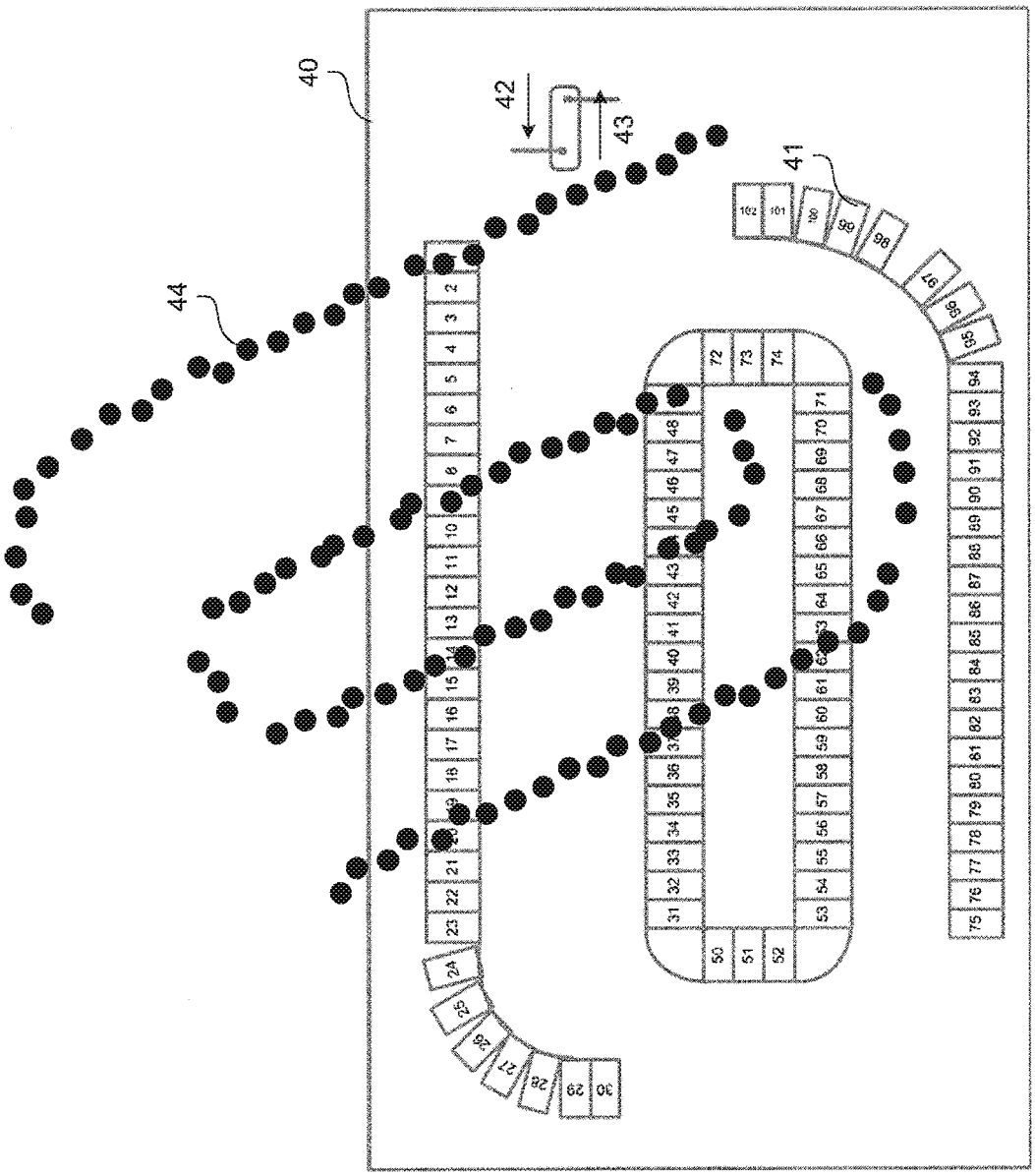
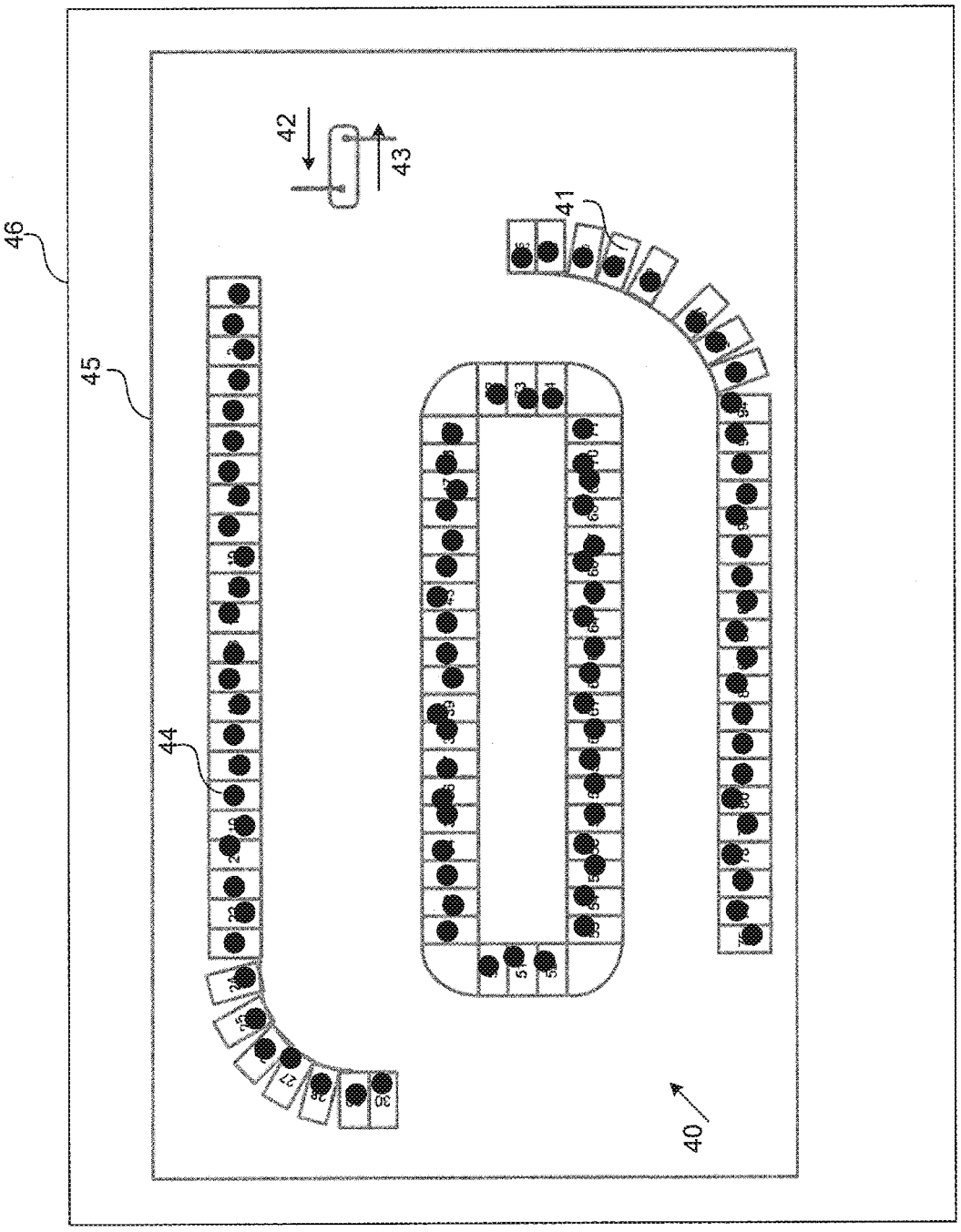


fig. 4

fig. 5



REFERENCES CITED IN THE DESCRIPTION

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